What Is Claimed Is:

1. A fiber, comprising:

an optical fiber having a first section and a second section coupled to the first section, the first section having a gain medium including a first active material and the second section having a gain medium including a second active material;

a first reflector disposed in the first section of the optical fiber, the first reflector being configured to reflect substantially all energy impinging thereon at a first wavelength; and

a second reflector disposed in the optical fiber outside the first section of the optical fiber, the second reflector being configured to reflect substantially all energy impinging thereon at the first wavelength.

2. The fiber of claim 1, wherein the first active material is the same as the second active material.

3. The fiber of claim 1, wherein the first active material is different than the second active material.

4. The fiber of claim 1, wherein the first and second sections are spliced together.

5. The fiber of claim 4, wherein the first reflector comprises a fiber Bragg grating.

6. The fiber of claim 3, wherein the second reflector comprises a fiber Bragg grating.

7. The fiber of claim 6, wherein the first active material comprises GeO_2.

8. The fiber of claim 7, wherein the second active material comprises P_2O_5.

9. The fiber of claim 1, wherein the second reflector comprises a fiber Bragg grating.

10. The fiber of claim 1, wherein the first active material comprises GeO_2.

11. The fiber of claim 10, wherein the second active material comprises P_2O_5.

12. The fiber of claim 1, wherein the first active material comprises P_2O_5.

13. The fiber of claim 1, further comprising a third reflector disposed in the optical fiber.

14. The fiber of claim 13, wherein the third reflector comprises a fiber Bragg grating.

15. The fiber of claim 13, wherein the third .reflector is disposed outside the first section of the optical fiber.

16. The fiber of claim 15, wherein the third reflector is between the first and second reflectors.

17. The fiber of claim 13, wherein the third reflector is configured to partially reflect energy impinging thereon at a second wavelength different than the first wavelength.

18. The fiber of claim 13, wherein the first and second sections are spliced together.

19. The fiber of claim 13, further comprising a fourth reflector disposed in the optical fiber.

20. The fiber of claim 19, wherein the fourth reflector comprises a fiber Bragg grating.

21. The fiber of claim 19, wherein the fourth reflector is disposed outside the first section of the optical fiber.

22. The fiber of claim 21, wherein the fourth reflector is between the first and third reflectors.

23. The fiber of claim 19, wherein the fourth reflector is configured to reflect substantially all energy impinging thereon at the second wavelength.

24. The fiber of claim 19, wherein the fourth reflector is disposed in the first section of the optical fiber.

25. The fiber of claim 19, wherein the first and second sections are spliced together.

26. The fiber of claim 19, further comprising a fifth reflector disposed in the optical fiber.

27. The fiber of claim 26, wherein the fifth reflector comprises a fiber Bragg grating.

28. The fiber of claim 26, wherein the fifth reflector is disposed in the first section of the optical fiber.

29. The fiber of claim 28, wherein the fifth reflector is between the first and fourth reflectors.

30. The fiber of claim 26, wherein the fifth reflector is configured to reflect substantially all energy impinging thereon at a second wavelength different than the first wavelength.

31. The fiber of claim 26, wherein the first and second sections are spliced together.

32. The fiber of claim 26, further comprising a suppressor disposed in the optical fiber, the suppressor being capable of substantially suppressing the propagation of energy within the optical fiber at a wavelength corresponding to a higher order Raman shift wavelength than the first wavelength.

33. The fiber of claim 32, wherein the suppressor is disposed in the first section of the optical fiber.

34. The fiber of claim 33, wherein the suppressor is between the first and fifth reflectors.

35. The fiber of claim 32, wherein the suppressor comprises long period gratings.

36. The fiber of claim 32, wherein the first and second sections are spliced together.

37. The fiber of claim 32, wherein the first active material comprises GeO_2.

38. The fiber of claim 38, wherein the second active material comprises P_2O_5.

39. The fiber of claim 32, wherein the second active material comprises P_2O_5.

40. The fiber of claim 1, further comprising a third reflector disposed in the first section of the optical fiber and between the first and second reflectors, the third reflector being configured to reflect substantially all energy impinging thereon at a second wavelength different than the first wavelength.

41. The fiber of claim 1, further comprising a suppressor disposed in the first section of the optical fiber and between the first and second reflectors, the suppressor being capable of substantially suppressing the propagation of energy within the optical fiber at a wavelength corresponding to a higher order Raman shift wavelength than the first wavelength.

42. The fiber of claim 41, wherein the suppressor comprises a long period grating.

43. The fiber of claim 1, wherein the first and second sections of the optical fiber are contiguous.

44. The fiber of any of the preceding claims, wherein the fiber is configured to be a fiber laser.

45. The fiber of claim 1, wherein the fiber is configured to be a fiber amplifier.

46. A system, comprising:

an energy source capable of emitting energy at a pump wavelength; and

a fiber, comprising:

an optical fiber having a first section and a second section coupled to the first section; the first section having a gain medium including a first active material and the second section having a gain medium including a second active material;

a first reflector disposed in the first section of the optical fiber, the first reflector being substantially totally reflective at a first wavelength; and

a second reflector disposed in the optical fiber outside the first section of the optical fiber, the second reflector being substantially totally reflective at a second wavelength,

wherein the energy source and the optical fiber are configured so that energy at the pump wavelength emitted by the energy source can be coupled into the optical fiber.

47. The system of claim 46, wherein the energy source comprises a laser.

48. The system of claim 47, wherein the energy sources is capable of lasing at the pump wavelength.

49. The system of claim 46, wherein the first material is the same as the second material.

50. The system of claim 46, wherein the first active material is different than the second active material.

51. The system of any of claims 46-50, wherein the fiber is configured to be a fiber laser.

52. The system of any of claims 46-50, wherein the fiber is configured to be a fiber amplifier.

53. A fiber, comprising:

an optical fiber having a first section and a second section spliced to the first section, the first section having a gain medium including a first active material and the second section having a gain medium including a second active material different than the first active material;

a first reflector disposed in the first section of the optical fiber, the first reflector being configured to reflect substantially all energy impinging thereon at a first wavelength;

a second reflector disposed in the second section of the optical fiber, the second reflector being configured to reflect substantially all energy impinging thereon at the first wavelength;

a third reflector disposed in the second section of the optical fiber, the third reflector being configured to partially reflect energy impinging thereon at a second wavelength different than the first wavelength; and

a fourth reflector disposed in the second section of the optical fiber and between the first and third reflectors, the fourth reflector being configured to reflect substantially all energy impinging thereon at the second wavelength.

54. The fiber of claim 53, further comprising a fifth reflector in the first section of the optical fiber and between the first and fourth reflectors, the fifth reflector being configured to reflect substantially all energy impinging thereon at a third wavelength different than the first and second wavelengths.

55. The fiber of claim 54, further comprising a suppressor in the first section of the optical fiber and between the first and fifth reflectors, the suppressor being capable of substantially suppressing the propagation of energy within the optical fiber at a wavelength corresponding to a higher order Raman shift wavelength than the first wavelength.

56. The fiber of claim 55, wherein the first active material comprises P_2O_5.

57. The fiber of claim 55, wherein the first active material comprises GeO_2.

58. The fiber of claim 57, wherein the second active material comprises P_2O_5.

59. The fiber of claim 58, wherein the first and second sections of the optical fiber are spliced together.

60. The fiber of claim 58, wherein the first and second sections of the optical fiber are contiguous..

61. The fiber of claim 53, further comprising a suppressor in the first section of the optical fiber and between the first and fifth reflectors, the suppressor being capable of substantially suppressing the propagation of energy within the optical fiber at a wavelength corresponding to a higher order Raman shift wavelength than the first wavelength.

62. The fiber of claim 53, wherein the first active material comprises GeO_2.

63. The fiber of claim 62, wherein the second active material comprises P_2O_5.

64. The fiber of claim 53, wherein the first active material comprises P_2O_5.

65. The fiber of claim 64, wherein the second active material comprises GeO_2.

66. The fiber of claim 53, wherein the first and second sections of the optical fiber are spliced together.

67. The fiber of claim 53, wherein the first and second sections of the optical fiber are contiguous.

68. The fiber of claim 53, wherein the fiber is configured to be a fiber laser.

69. The fiber of claim 53, wherein the fiber is configured to be a fiber amplifier.

70. A fiber laser system, comprising:

an energy source capable of emitting energy at a pump wavelength; and

a fiber, comprising:

an optical fiber having a first section and a second section spliced to the first section, the first section having a gain medium including a first active material and the second section having a gain medium including a second active material different than the first active material;

a first reflector disposed in the first section of the optical fiber, the first reflector being configured to reflect substantially all energy impinging thereon at a first wavelength;

a second reflector disposed in the second section of the optical fiber, the second reflector being configured to reflect substantially all energy impinging thereon at the first wavelength;

a third reflector disposed in the second section of the optical fiber, the third reflector being configured to partially reflect energy impinging thereon at a second wavelength different than the first wavelength; and

a fourth reflector disposed in the second section of the optical fiber and between the first and third reflectors, the fourth reflector being configured to reflect substantially all energy impinging thereon at the second wavelength

wherein the energy source and the optical fiber are configured so that energy at the pump wavelength emitted by the energy source can be coupled into the optical fiber.

71. The system of claim 64, wherein the energy source comprises a laser.

72. The system of claim 65, wherein the energy source is capable of lasing at the pump wavelength.

73. The system of claim 70, wherein the fiber is configured to be a fiber laser.

74. The system of claim 70, wherein the fiber is configured to be a fiber amplifier.

75. A fiber, comprising:

an optical fiber having N sections, the N sections being coupled together, at least one of the N sections of the optical fiber having a gain medium with an active material; and

a plurality of reflectors disposed in the optical fiber,

wherein N is an integer having a value of at least three.

76. The fiber of claim 75, wherein N is three.

77. The fiber of claim 75, wherein N is four.

78. The fiber of claim 75, wherein N is five.

79. The fiber of claim 75, wherein N is six.

80. The fiber of claim 75, wherein at least two of the N sections of the optical fiber have a gain medium with an active material.

81. The fiber of claim 80, wherein the active material in one of the at least two of the N sections of the optical fiber is different than an active material of another of the N sections of the optical fiber having a gain medium.

82. The fiber of claim 75, wherein each of the N sections of the optical fiber have a gain medium with an active material.

83. The fiber of claim 75, wherein the optical fiber has a first section with an end configured to receive energy at a wavelength λ_p, the first section of the optical fiber having a first reflector disposed therein, the first reflector being configured to reflect substantially all energy impinging thereon at a wavelength λ_{s1}, where $\lambda_{s1}^{-1} = \lambda_p^{-1} - \lambda_{r1}^{-1}$, (c/λ_{r1}) is the Raman Stokes shift frequency for an active material in a gain medium in the first section of the optical fiber, and c is the speed of light.

84. The fiber of claim 83, wherein the optical fiber has an N^{th} section with an end opposite the end of the first section, the N^{th} section of the optical fiber having a first reflector disposed therein, the first reflector being configured to reflect substantially all energy impinging thereon at a wavelength λ_{s1n}, where $\lambda_{s1n}^{-1} = \lambda_{s1(n-1)}^{-1} - \lambda_{rn}^{-1}$, and (c/λ_{rn}) is the Raman Stokes shift frequency for an active material in a gain medium in the N^{th} section of the optical fiber.

85. The fiber of claim 84, wherein the N^{th} section of the optical fiber has a second reflector disposed therein, the second reflector being configured to partially reflect energy impinging thereon at the wavelength λ_{s1n}.

86. The fiber of claim 85, wherein the N^{th} section of the optical fiber has a third reflector disposed therein, the third reflector being configured to reflect substantially all energy impinging thereon at the wavelength $\lambda_{s1(n-1)}$, where $\lambda_{s1(n-1)}^{-1} = \lambda_{s1(n-2)}^{-1} - \lambda_{r(n-1)}^{-1}$, and $(c/\lambda_{r(n-1)})$ is the Raman Stokes shift frequency for the active material in the $(N-1)^{th}$ section of the fiber.

87. The fiber of claim 86, wherein each of the remaining sections of the optical fiber has two reflectors disposed therein, one of the reflectors disposed in each of the remaining sections of the optical fiber being configured to reflect substantially all energy impinging thereon at a wavelength λ_{s1m}, where $\lambda_{s1m}^{-1} = \lambda_{s1(m-1)}^{-1} - \lambda_{rm}^{-1}$, and (c/λ_{rm}) is the Raman Stokes shift frequency for an active material in the section of the fiber.

88. The fiber of claim 87, wherein the other of the reflectors disposed in each of the remaining sections of the optical fiber is configured to reflect substantially all energy impinging thereon at a wavelength $\lambda_{s1(m-1)}$, where $\lambda_{s1(m-1)}^{-1} = \lambda_{s1(m-2)}^{-1} - \lambda_{r(m-1)}^{-1}$, and $(c/\lambda_{r(m-1)})$ is the Raman Stokes shift frequency for an active material in an immediately preceding section of the optical fiber.

89. The fiber of claim 88, wherein each of the remaining sections of the optical fiber has two reflectors disposed therein, one of the reflectors disposed in each of the remaining sections of the optical fiber being configured to reflect substantially all energy impinging thereon at a wavelength λ_{s1m}, where $\lambda_{s1m}^{-1} = \lambda_{s1(m-1)}^{-1} - \lambda_{rm}^{-1}$, and (c/λ_{rm}) is the Raman Stokes shift frequency for an active material in the section of the fiber.

90. The fiber of claim 89, wherein the other of the reflectors disposed in each of the remaining sections of the optical fiber is configured to reflect substantially all energy impinging thereon at a wavelength $\lambda_{s1(m-1)}$, where $\lambda_{s1(m-1)}^{-1} = \lambda_{s1(m-2)}^{-1} - \lambda_{r(m-1)}^{-1}$, and $(c/\lambda_{r(m-1)})$ is the Raman Stokes shift frequency for an active material in an immediately preceding section of the optical fiber.

91. The fiber of claim 75, wherein the fiber is configured to be a fiber laser.

92. The fiber of claim 75, wherein the fiber is configured to be a fiber amplifier.

93. A fiber system, comprising:

an energy source; and

a fiber, comprising:

an optical fiber having N sections, the N sections being coupled together, at least one of the N sections of the optical fiber having a gain medium with an active material; and

a plurality of reflectors disposed in the optical fiber;

wherein N is an integer having a value of at least three, and the energy source and the optical fiber are configured so that energy at a wavelength emitted by the energy source can be coupled into the optical fiber.

94. The system of claim 93, wherein the fiber is configured to be a fiber laser.

95. The system of claim 93, wherein the fiber is configured to be a fiber amplifier.

96. A fiber laser, comprising:

an optical fiber having at least first and second sections coupled together, the first section having a first gain medium with a first active material, the second section having a second gain medium with a second active material, the optical fiber being configured to be capable of receiving energy at a first wavelength and to be capable of outputting energy at a second wavelength longer than the first wavelength; and

a plurality of reflectors disposed in the optical fiber, the plurality of optical fibers being configured so that energy propagating in the optical fiber at the first wavelength undergoes at least one Raman Stokes shift to create energy in the optical fiber at the second wavelength, and so that, when the optical fiber receives energy at the first energy, a power output by the optical fiber at the second wavelength is at least about 55% of a power of the energy the optical fiber receives at that first wavelength.

97. The fiber laser of claim 96, wherein the first active material is the same as the second active material.

98. The fiber laser of claim 96, wherein the first active material is different than the second active material.

99. The fiber laser of claim 96, wherein energy propagating in the optical fiber at the first wavelength undergoes at least two Raman Stokes shifts to create energy in the optical fiber at the second wavelength.

100. The fiber laser of claim 96, wherein, when the optical fiber receives energy at the first energy, a power output by the optical fiber at wavelengths other than the first and second wavelengths is at most about 45% of the power of the energy the optical fiber receives at that first wavelength.

101. The fiber laser of claim 96, wherein the first and second sections are directly coupled together.

102. The fiber laser of claim 96, wherein the first and second sections are spliced together.

103. The fiber laser of claim 96, wherein energy propagating in the optical fiber at the first wavelength undergoes a Raman Stokes shift based interaction with the active material contained in the gain medium of the first section of the optical fiber to form energy at a first intermediate wavelength, and energy at the first intermediate wavelength undergoes a Raman Stokes shift based on interaction with the active material contained in the gain medium of the second section of the optical fiber to form a second intermediate wavelength.

104. The fiber laser of claim 103, wherein the second intermediate wavelength is the same as the second wavelength.

105. The fiber laser of claim 103, wherein energy propagating in the optical fiber at the second intermediate wavelength undergoes additional Raman Stokes shifts to form energy at the second wavelength.

106. An article, comprising:

an optical fiber having multiple sections, with at least two of the multiple sections having gain media containing different active materials.

107. The article of claim 106, wherein the optical fiber is configured as a fiber amplifier.

108. The article of claim 106, wherein the optical fiber is configured as a fiber laser.

109. A system, comprising:

an energy source capable of emitting energy at a pump wavelength; and

a fiber amplifier, comprising:

an optical fiber having a first section and a second section coupled to the first section; the first section having a gain medium including a first active material and the second section having a gain medium including a second active material,

wherein the energy source and the optical fiber are configured so that energy at the pump wavelength emitted by the energy source can be coupled into the optical fiber.

110. The system of claim 109, wherein the first active material is the same as the second active material.

111. The system of claim 110, wherein the first active material is different than the second active material.

112. The system of claim 110, wherein the energy source comprises a laser.

113. The system of claim 112, wherein the energy sources is capable of lasing at the first wavelength.

114. A fiber amplifier, comprising:

an optical fiber having N sections, the N sections being coupled together, at least one of the N sections of the optical fiber having a gain medium with an active material,

wherein N is an integer having a value of at least three.

115. The fiber amplifier of claim 114, wherein N is three.

116. The fiber amplifier of claim 114, wherein N is four.

117. The fiber amplifier of claim 114, wherein N is five.

118. The fiber amplifier of claim 114, wherein N is six.

119. The fiber amplifier of claim 114, wherein at least two of the N sections of the optical fiber have a gain medium with an active material.

120. The fiber amplifier of claim 119, wherein the active material in one of the at least two of the N sections of the optical fiber is different than an active material of another of the N sections of the optical fiber having a gain medium.

121. The fiber amplifier of claim 114, wherein each of the N sections of the optical fiber have a gain medium with an active material.